Battling Rising Wind Tower Costs with Creative Solutions

Constructing and installing a wind turbine tower is an expensive proposition by any measurement, causing many in the industry to look for ways to lower the costs of the process. By one estimate, between 30 percent and 50 percent of the cost of installing an *offshore* wind turbine comes from the tower and substructure installation, though these costs are somewhat different for onshore installations.

Many factors play into the overall cost of a wind turbine tower. Perhaps one of the biggest impacts is the fact that commodities costs have been fluctuating and rising. For steel and copper in particular, which can account for 20 percent to 40 percent of the component's price, this is extremely problematic.[i]

Of course, a greater emphasis in offshore rather than onshore wind farm installations has also caused installed costs for wind turbines to rise over time. Not only that, but demand for towers (as well as components such as blades, gear boxes, and bearings) has increased more quickly than the supply chain has been able to accommodate. This plus the increased sophistication of turbine tower design has meant higher installed costs.

As a result, there has been a consistent cry for turbine tower costs to come down by any means necessary. Installation techniques, component design, as well as technical and methodological processes are all being addressed to create wind turbine towers that are more cost effective from the start.

Technical Improvements for More Cost-Effective Wind Turbines

Siemens' Bolted Steel Shell Turbine Tower

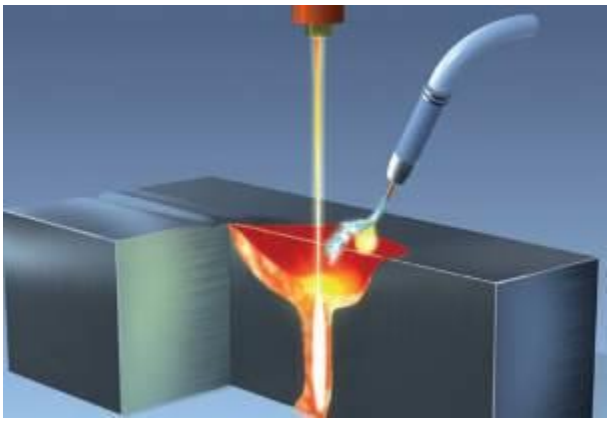
It goes without saying that one of the most important ways to reduce the overall costs of a turbine tower is to make a turbine that produces more energy once commissioned. This lowers the cost per kWh of energy produced, thereby making the entire project more profitable in the long run. Though growing the size of turbine towers means using more materials and incurring higher costs for taller and heavier towers, the expensive is generally worth it for a turbine that will generate a lot of energy by reaching for

better wind speeds at higher altitudes.

That said, many companies are looking for ways to cut the capital costs of manufacturing and installing a turbine tower in order to lower the up-front expenses associated with the project. Of course, one of the more well-known ways to reduce the manufactured cost of the wind turbine tower, especially for those in excess of 100 meters, is to use the hybrid tower design. By constructing the tower partially of concrete, not only are turbine component transportation costs lowered by sourcing materials locally and using local manufacturers, so are parts construction and installation costs reduced.[ii]

But companies like Siemens are looking for ways to reduce the costs of their traditionally all-steel designs as well. Rather than using large and heavy steel segments with six-meter diameter tubes that are stacked and joined at the construction site, Siemens has designed and have been using (since 2012) bolted steel shells for tall towers. These are constructed from a total of 14 to 18 segments that are bolted together, allowing individual segments to be shipped separately to reduce transport costs. These smaller segments are also cheaper to manufacture and can be produced in higher volumes. The company believes this provides substantial savings for each tower installed.[iii]

Another innovation being pressed into service for the sake of lower costs is the use of laser-hybrid welding, which is being used by LORC. Though this technology comes with a high capital investment, it is an extremely high-speed manufacturing method for constructing wind turbine towers and offshore support structures such as jackets.



LORC Laser Hybrid Welding Process

Conventional welding of these components can be extremely time consuming, especially since the length of the joints of the plates on a contemporary wind turbine tower measures about half of a mile. As wind turbine towers grow in height, this length will only increase over time.

By contrast, laser welding technology, which is not new, makes every day welding tasks such as welding together sheets of steel several inches thick extremely quick. Not only that, but this technology lowers variable costs and is capable of repeating the same task over and over without loss of quality.

LORC representatives made these comments about the advancement:

"The LWT laser system consists of two separate disc lasers each of 16 kW which can be combined through transport fibers to provide 32 kW at the work-piece. This gives a high flexibility which makes them suited for robotic welding."[iv]

Though some technical challenges have yet to be worked out in terms of applying laser welding technology to the wind turbine construction sector, there is a lot of optimism about this option as a way of lowering installation costs.

These are just two ways the industry is responding for demands for lower parts costs. Many advancements in the techniques used for transporting and installation are also being trialed.

Going Local to Lower Turbine Tower Installation Costs

Doubtless one of the largest costs associated with the installation of a wind turbine tower is the transportation of the components from the manufacturer to the installation site. As such, one of the biggest pushes by governments is to encourage the production of turbine tower components domestically. After all, any reduction in the distance the tower has to travel results in substantial savings.

This is one of the things the UK has done to lower the overall installed cost of their new wind turbines. The two new UK plants that are manufacturing turbine towers provided 220 towers in 2011 which was about one-third of the overall turbines constructed that year. Projections show that as the UK pushes to reach its installed wind goals that these two plants will continue to play a large role in the industry, helping the nation as a whole to accomplish their aims at an overall lower cost.[v]

Further to the transportation costs for the turbine towers, many projects are looking to source non-specialized equipment from local suppliers. According to the UK Department of Energy and Climate Change, up to 20 percent of the cost of a wind turbine tower comes from things such as ladders, cabling, plates, electronics, and

lighting within the internal portion of the tower itself.[vi] Many of these components are non-specialized, and as a result can be sourced from non-specialized manufacturers. Sourcing these components locally not only reduces costs by going generic, it also lowers transportation costs for parts that would otherwise be imported from specialist manufacturers.

In addition to lower transport costs, companies are also working one ways to lower the costs of installation. One of the methods being explored for lowering offshore wind turbine installation costs, for instance, is the telescopic tower. In conventional wind turbine tower installation models, jackups and large, expensive cranes are used to install the towers once the components have been transported out to see. Weather conditions and availability of specialized vessels increase the costs of these installations.

By contrast, a self-installing telescopic turbine tower can be reverse-installed to significantly reduce the installation costs. The idea is for the blades to be towed out to sea in the horizontal position on a hoop. The tower is raised using a telescoping motion, with the blades rotating with the hoop in the horizontal position. Once the tower has been raised completely, the blades are shifted to their vertical position for final installation.[vii]

This method lowers the center of gravity which means towing becomes much easier and cost-effective. Additionally, by using this method, the turbine can be assembled onshore using cranes there rather than expensive vessel-bound cranes. Though this technology requires further testing before it can be proved out, the concept holds a lot of promise for lowering the costs of installing offshore turbine towers.[viii]

Greater Collaboration and More Research for Even Lower Tower Costs

Certainly the techniques already surveyed are going a long way to helping control turbine tower costs, however more needs to be done. Perhaps one of the most effective systems for lowering turbine tower costs is the industrial partnership. Today, wind turbine tower technology is traditionally developed in isolation with many competing companies working on their own independent designs. While this may encourage greater cost competition, it may overall hurt the rapid advancement of the industry. Collaboration between industrial companies working on similar design, production, and installation methods could help to create greater efficiencies

in the creation of wind turbine towers and result in a system that is overall much more cost-effective to run. As more companies address these cost issues, hopefully some will choose to form strategic partnerships to being about the rapid cost reductions needed to move the industry forward.

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